

Volume IV No. 7

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### ENGINEERING BALL

On January 20th, the Engineering Association staged its Annual mid-term dance at the Berkeley Hotel. Many of the Engineers from both day and evening division turned out to do some high stepping after their weeks of study.

The gala affair started to liven up when Bert Martin and Co. arrived. It seemed that Bert had quenched his thirst before coming, judging from the way he greeted everyone with that big "hello". Meanwhile, Barry Smith did some revising in his little black book. It seems that he had trouble keeping his girls in line. On the other hand, Barry Shacter accompanied a Mediterranean beauty and could not even keep out of the dark kitchen long enough to do a little dancing.

The professors added much to the evening by bringing with them their wives and girlfriend. Prof. Borden arrived in a cloud of smoke and left on an even keel, to most of the students dismay. Prof. Goldman could not understand why so many students were there and not at home working on mechanics problems. Prof. Igbal did nothing but dance up a storm all evening.

The evening entertainment was evenly divided up between rock'n rolls, twists and waltzes. Pierre Leduc added his musical skills on the piano and, Bert and Ian formed a duet, blending their "golden voices". All were wildly applauded by the fellows.

These were only a few of the highlights as the evening was one continuous swinging affair with everyone leaving in a festive frame of mind. Everyone is looking forward to the next, and we hope bigger, Engineering Ball.

Art Kleinman & Harold Cohen.

Chief Mud-In-Your Eye liked tea very much. In fact, one day he bought gallons of it and took it home to drink. Next morning they found him drowned in his own teepee.



DOPPLER RADAR

Doppler effect is quite noticeable in sound waves in the form of the apparent increase in the frequency of the sound source as it moves toward an observer and decrease in apparent frequency as it moves away from the observer. The same is true of radio waves. The frequency of the echo from a target moving toward the radar station is slightly greater than the magnetron frequency. The exact difference in frequency between the transmitted and received wave is directly proportional to the component of the target velocity toward or away from the transmitting site. This permits the development of a very simple radar system for accurately measuring the speed of automobiles. The block diagram for such a "police" radar is shown in Fig. 1.

Because of the round trip of a radar signal, each half wavelength of target movement toward the radar set causes a  $360^\circ$  phase shift in the reflected signal. Therefore, a velocity measured in terms of half wavelengths of the radar frequency is numerically the same as the frequency difference (Doppler frequency) between the transmitted signal and reflected signal. Radar speed meters operate in the 2450-2500 Mc band. For a typical frequency of 2455 Mc,

$$f_d \text{ (cps)} = 7.31 v \text{ (mph)}$$

Therefore, a car travelling 50 mph will cause an audio beat note in the crystal mixer of  $365\text{-}1/2$  cps.

A 2c40 lighthouse tube in a resonant cavity tuned circuit produces a quite stable 2455 Mc output of about 120 milliwatts. A hybrid ring made from a 50 ohms coaxial cable provides two paths between all terminals on the ring. Transmitted signal arrives at the antenna by these two paths in phase but at the crystal mixed  $180^\circ$  out of phase. Similarly, the reflected signal received by the antenna arrives in phase at the crystal but out of phase at the transmitter. The 60 ohm terminating resistor needed with the hybrid ring absorbs half the transmitter and received power. The crystal mixer produces the Doppler beat between the transmitter frequency and the reflected signal from the moving target. This is amplified by four stages of audio amplification. To register slow moving targets, these audio stages must have good low frequency response. The first stage of the limiter (V5) clips the positive peaks due to its positive bias.

When no moving target is within range (about 175 ft.) only noise appears at the limiter grid. This is not sufficient to make the first limiter draw grid current for grid leak bias. As a result, plate current in this tube keeps the plate voltage so low that the DC coupled grid in the right half of V4 keeps this half of V4 cut off. As a result, the plate of the right hand half of V4 is more positive than the plate of the left hand half of V4. This causes the diodes of the clamper (V3) to conduct, thus connecting an attenuator consisting of 200 K resistor and a 51K resistor into the signal input to V5, thus minimizing or "squenching" the noise signal. However, a Doppler beat causes V5 to produce grid leak bias which raises its average plate voltage. This causes the right hand half of V4 to



conduct, thus lowering the right hand plate voltage and raising the plate voltage of the left hand half of V4 so that the left plate is now more positive than the right. This cuts off the clamper diodes which effectively removes the attenuator from the circuit allowing full gain when a proper Doppler signal is being fed to the limiter.

At the right hand plate of the limiter, a series of constant amplitude audio waves of the Doppler frequency appears. Each time the plate voltage rises, the calibrating capacitor and the 1.0 uf in series charge through the right hand half of the cycle counter V6. Each time the plate voltage of the second limiter drops, the additional charge gained by the calibrating capacitor is discharged through the left half of V6. On the next rise of limiter plate voltage, the calibrating capacitor charges again, thus adding to charge on the 1.0 uf capacitor. The higher the audio frequency, the greater the rate at which charge is added to the 1.0 uf capacitor. Its discharge rate is determined by the 1 meg precision resistor across it. The net result of the cycle counter action is that a DC voltage proportional to the Doppler frequency and therefore, proportional to target velocity, appears across the 1.0 uf capacitor. This voltage is measured by the customary "long-tailed pair" type of V.T.V.M. Two meters are usually supplied (connected in series). One is a five-inch milliammeter calibrated in miles per hour and the other is a recording milliammeter to provide a permanent record.

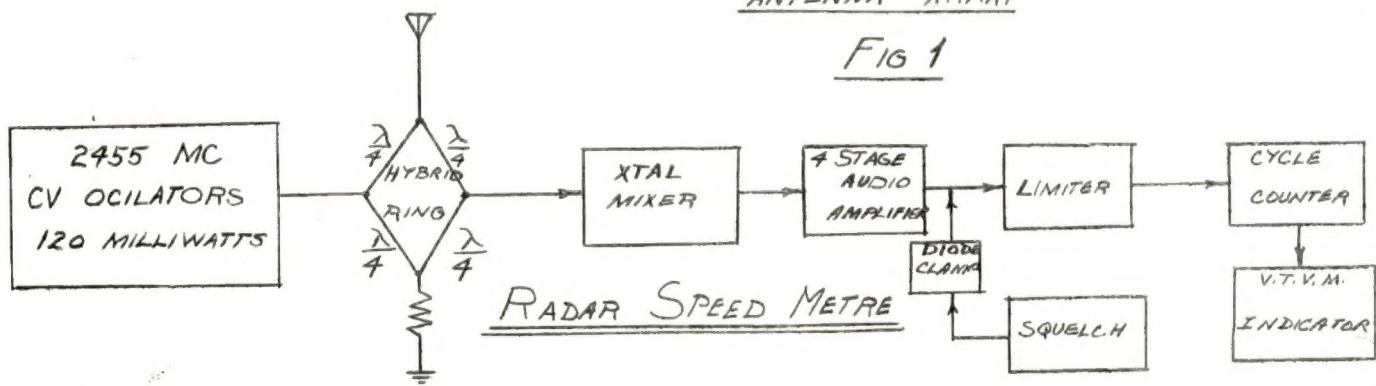
Because of the low power and simple circuitry, the whole unit is only the size of a loaf of bread. And at a frequency of 2455 Mc, a billboard array of eight dipoles (producing a  $20^\circ$  beam width) is only slightly larger than postcard size and is mounted right on the unit and protected by a plastic cover.

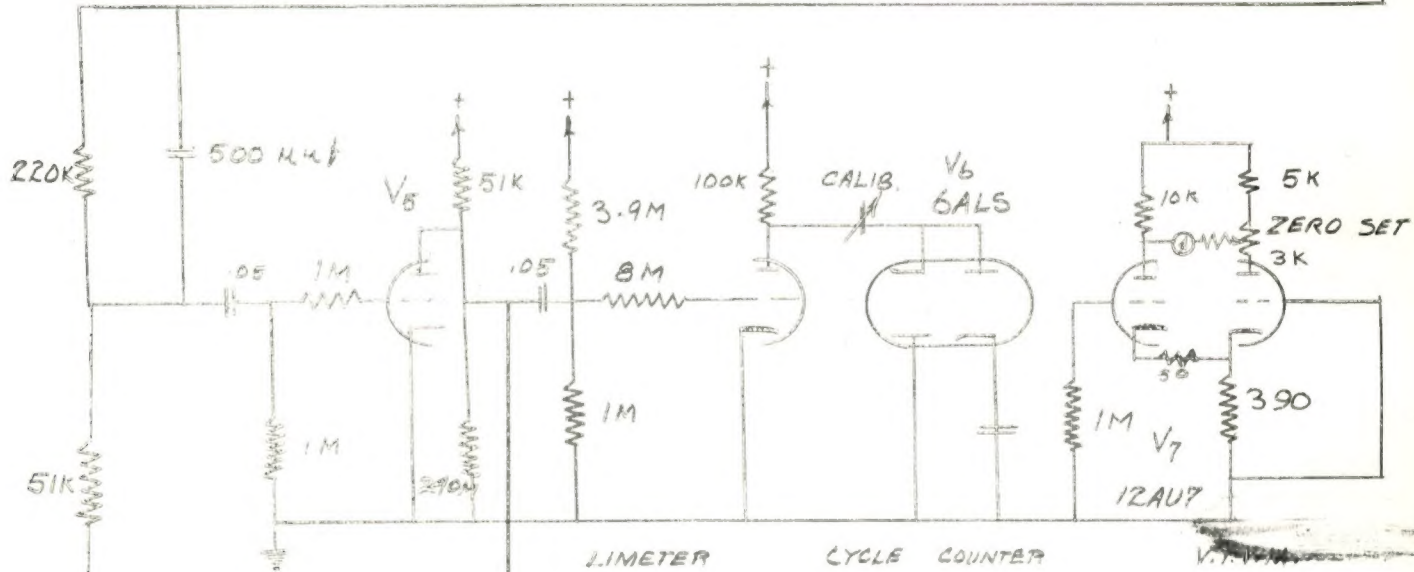
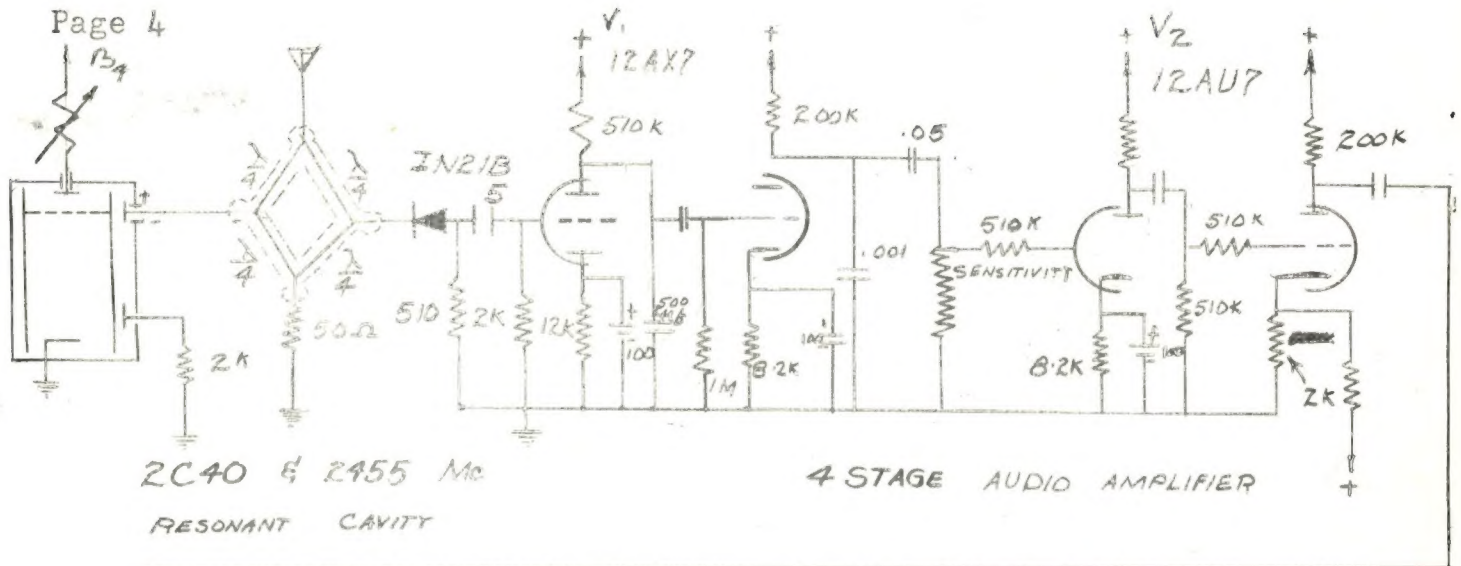
A somewhat similar piece of equipment is the absolute altimeter or terrain clearance indicator. If the aircraft flies at a constant altitude, there will be no Doppler beat between the transmitter frequency and the echo from the ground. But if the transmitter is frequency modulated, there will be a frequency difference between the transmitter frequency and that reflected from the ground, since the received signal left the transmitter several microseconds earlier. The audio beat note in this case is proportional to the time it takes the signal to reach the ground and be reflected. Therefore, a cycle counter can be used to translate the audio beat into an altitude indication.

### 8 DIPOLE "BILL BOARD"

ANTENNA ARRAY

FIG 1





SIMPLIFIED SCHEMATIC DIAGRAM  
OF A DOPPLER RADAR METRE.

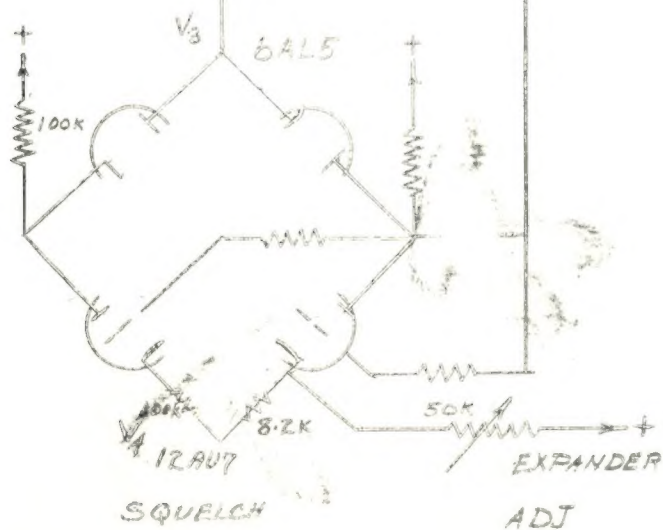


FIG. 2



ODE TO A DANCE

The other day upon a bus,  
 Everyone was staring at us,  
 We looked so happy, gay and bright,  
 As I rode along with her that night.

She didn't seem to mind the trip,  
 For she knew that at the end of it,  
 The Berkeley Hotel in the Cartier Room,  
 Would soon be dancing up a merry tune.

Not only we, were present there,  
 There didn't seem much room to spare;  
 Hi John, Bert, George, Iggy, Bert and Ben,  
 Hey! How did Bert get counted again?

And as the band began to play,  
 The dance really got under way,  
 Is someone trying to do me in?  
 I didn't know Tchaikovsky played the violin.

Glasses were filled, and filled again,  
 O.K. Steve, just say when,  
 The room took on a different hue,  
 Lights were dimmed; so--what's new?

Someone better tell Shacter,  
 He won't get what he's after,  
 Goldy's drinking and his antics,  
 Won't change his mind about  
 Mechanics.

Later on the band was missed,  
 Maybe they went out for a pi--,  
 Oh well, don't go and fret,  
 Bert and Ian will sing a duet.

Ah! Fill her up; what de hek,  
 I'm not under the table yet,  
 And I bet you can't get me drunk.  
 (Gee! What will rhyme with all  
 that junk?)

Well I guess its time to go,  
 Where do we meet after Joe.  
 Good-bye Mary, Heather, Jane  
 and Bert,  
 How did he get in there again,  
 the J-rk?

The other day upon a bus,  
 Everyone was staring at us,  
 We looked so happy, gay and tight,  
 As she rode herd on me that night.

E.I.C.

It has been brought to my attention that some of the Engineers are desirous to use the E.I.C. Library but don't know how to go about it.

It is really quite simple as it is almost the same as any other library-; just drop over to 2050 Mansfield any day of the week until 6 P.M. and ask the receptionist to show you where it is. You will find its well worth your time as there is a wealth of material here, especially for the Second Year design project!

One word of caution, though, know what you want before you go or you will have a hard time finding it since their cataloging is rather behind the times. Nevertheless, it is considered to be one of the most complete technical libraries in Canada.

Dave Hamilton,  
 E.I.C. Rep. Eng. II



HAVE YOU HEARD ABOUT THE LITTLE MORON WHO.....

- Was a radio announcer and went to bed every night with his wife, or a reasonable facsimile.
- Moved to the city because he heard the country was at war.
- Ate bullets so he could have bangs.
- Pushed the cow off the cliff so he could hear the Jersey Bounce.
- Took liquor to bed with him so he could sleep tight.

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COMING MOVIES

Feb. 21 - The DuPont Story	Room: 327
Feb. 28 - West Coast Cargo (Colour)	Room: 327
Mar. 7 - The Open Road	Room: 327

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NEWS NOTES

On Feb. 16, an organized and highly intellectual "slosh" party will be held at E.I.C. headquarters (2050 Mansfield) at 7:30. To increase the number of Sir George students attending, the latter will be entertained by talks given by Derek Bright and others, unknown, unmentionables.

The Monday discussions are extremely informative. It is quite encouraging to meet a graduate engineer of Sir George.

Congrats to the Wymans on the arrival of an eight pound girl. Incidentally, that is their second.

SPORTS - Engineering game won (by commerce). Our team outplayed these ex-arts and science men for 55 min. of the 60 min. game. However, while our team was changing players, the commerce team slipped in 15 goals. It seemed as if we were on a strong come-back but due to injuries and poor refereeing we scored only 5.

Fine organization has shelved the engineering basketball team - thanks Nick and assistants!

Floor hockey is starting up. We will be participating in a female league. So keep your sticks in good shape fellows.

(Barry Shacter)

SNOW SCULPTURING - Promises. Promises. Results? Five 2nd year fellows proceeded to build a typical outhouse, complete with..... and everything. The only casualty during construction was a broken ice chopper. Dave M., Rod E., Barry S., Dan Y. and Alex S. thank everyone for their co-operation.

TRIP - On our next trip we are going to sobber up. We will be a perfect example of good innocent Engineers; at least that will be the report in the Flush. We have stacks of cases, bottle openers, women and no where to go. We need a good excuse. If you have one or know of an interesting place to float, be sure to see Barry Smith.

(Barry Shacter.)



KEEPING THE FLOW CONSTANT

For ages the two sexes have been racing for supremacy. Now they have settled down to neck and neck.

Sak: (Feeling his friend's bald spot) "Feels as smooth as my wife's bottom."

Pak: (Feeling it himself) "By George, you're right".

A woman finally found she could get a divorce from her husband because of his flat feet. His feet were in the wrong flat.

Mama: "I'm so glad to see you sitting so quiet while your father naps."

Junior: "I'm watching his cigarette burn down to his fingers."

Said the rat as the cat grabbed him by the nape of the neck: "This puwwy iw killint me!"

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DOWN THE DRAIN

- Uncle Jack is now smoking 3¢ cigars! Or so he said at the dance.
- The lab. report read, "Remove the telescope and focus it on the red light in the hall." Who told those guys that a nurse in the Drummond Medical Court will get the telescope in sharper focus? Those lab. reports need revising.
- Sir George may have this "Georgie" as a maskot, but Eng. 11 also have theirs: A skinny suction flusher that looks real sexy with that hat, scarf and weed.
- Joe Bourdeau has been keeping a close watch on a certain blonde lately! Her locker is right next to 314. Any ideas???
- Manny hasn't been bringing in those "Playboys" any more. He's afraid of distrubing Miss Vowles.
- All comments concerning the orchestra at the dance should be directed to GERRY HUBERDEAU. In case you don't know, it was his orchestra.
- All the maintenance crew of Sir George should be careful about their jobs. According to the Georgian, "Sex" is now sweeping the campus.
- In keeping up with the high standard of the speakers Bert, the fellows would like you to find a good looking female...(female engineer that is.)
- Fred doesn't think a T-square will save him from going down the drain. You know, he's right.
- Santa Iqqy and his little helper are the main target for the second year boys lately. An antiquated riveted boiler assignment wasn't too popular.
- Prof. G. thinks a riveted boiler is a riot nowadays; but when a fellow prof. wants one! Well now.....
- Donate generously: The proceedings of the collection are to help "Aida" Senez keep his wife on the gravy train.